REMARKS

Claims 1 and 3-16 were examined, and are presented for reconsideration. Claim 1 is the sole independent claim. Claims 1, 3-6 and 15 are amended herein for the sake of improved clarity and focus. The indication of allowable subject matter in claim 13 is noted, with appreciation.

Objection to the Specification

The amendment to page 9 (¶ 0029 of the published specification) cures the noted conflict of reference numbers.

Claim Warning

The dependency of claim 15 has been changed to avoid potential overlap with claim 7.

Rejection Under 35 U.S.C. §112, 1st ¶

Original claim 4 stands rejected under 35 U.S.C. § 112, 1st ¶, as allegedly lacking support in the specification. Claim 4 has been amended to recite that "the length of the plurality of vibration exciters along the panel" is longer than the wavelength of sound in air at the lowest required frequency. This language is fully supported by at least ¶¶ 0011, 0012 and 0045 of the published specification. Withdrawal of the rejection is therefore in order.

Rejection Under 35 U.S.C. §103(a)

Claims 1, 3-12 and 14-16 are rejected under 35 U.S.C. §103(a) as unpatentable over Bank (US 6,456,723) in view of Bank (WO 00/33612). Any resemblance between Bank '723 and Bank '612 and the present invention is only superficial, the present invention being clearly patentable over the combined teachings of Bank '723 and Bank '612. Thus, the rejection is respectfully traversed for at least the following reasons.

The present invention is directed to a resonant bending wave panel speaker having a panel of aspect ratio greater than 2:1. An ideal ratio of bending stiffness B and areal density μ is

defined but otherwise the panel has conventional, moderate or negligible anisotropy of bending stiffness. If driven in a conventional manner, such a resonant panel radiator would be essentially omni-directional. However, the aim of the invention is to direct the majority of the panel's sound output more efficiently into one plane so as to avoid driving unwanted acoustic space via the other plane. This is achieved by using a plurality of vibration exciters, e.g. a line of drivers, on the panel. The exciters drive the panel so that the sound output is narrowed in the plane aligned with the exciters and unchanged in the transverse plane. The drive signals to the array of exciters may be electrically shaped to further control the radiation pattern.

The device of Bank '723 is a single-axis high aspect ratio panel, rather than a conventional off-square, two-axis bending wave distributed mode panel radiator according to WO97/09842. See Bank '723 at col. 1, line 64 to col. 2, line 14. Such a device is required for awkward product applications where the long axis of the slim sound radiator must be disposed horizontally and is required to have a wide horizontal directivity to serve an audience, e.g., for a TV monitor.

As described in col. 2, lines 15 to 23 of Bank '723, sound is preferentially emitted into a plane perpendicular to the panel through the modal axis and reduced in a plane perpendicular to the modal axis through the non-modal axis. Thus, as shown in Figures 2 and 3 (see col. 4, lines 13 to 23), the radiation angle is narrow in the length (non-modal) plane and much wider for the shorter (modal) plane. This directivity is achieved by encouraging bending mode behavior in that axis, which provides a naturally wide radiation angle for that plane. As explained in col. 2, lines 28 to 53, parameters for the panel, including the anisotropy of bending stiffness, are chosen so that bending in the vertical direction is minimized, thus controlling the angle of radiation in the vertical plane. In particular, bending stiffness for the narrow dimension is set high, placing the bending frequencies in this dimension above the significant operating range.

There is no suggestion in Bank '723 of using the transducers to assist in providing the desired directivity; this is achieved only by adjusting the panel parameters. As set out in col. 2, line 65 to col. 3, line 9, a single transducer mounted along the modal axis or laterally displaced therefrom may be used. Multiple transducers may be used and these are mounted across the

width of the panel to provide increased output. There is no teaching or motivation in Bank '723 to mount the transducers in another orientation. Indeed, mounting them in another orientation, such as rotating them 90° as suggested in the Office Action, would be contrary to the teachings of Bank '723 because it would not provide the desired increased output of radiation, which is narrow in the length (non-modal) plane and much wider for the shorter (modal) plane. "If [as here, the] proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) …." MPEP §2143.01V. Further, "[if, as here,] the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) …." MPEP §2143.01VI.

In summary, Bank '723 teaches using panel parameters, e.g. anisotropy of bending stiffness and high aspect ratio geometry, to inhibit bending wave action in the smaller width direction so that the bending waves associated with the length dimension dominate. An intendedly wide directivity is provided across this longer dimension, which may be suitable for specialized applications. Multiple exciters may be mounted to the panel to drive this specialized panel and they are mounted along (or adjacent) the modal (i.e. shorter, width) axis to increase output. In contrast, the radiation pattern provided by the presently claimed invention is the opposite of that taught in Bank '723, i.e. the invention provides a wide radiation angle from its narrower dimension in contrast to Bank '723, which delivers a wide radiation angle from its considerably extended horizontally disposed length dimension.

By using the exciters to control directivity, one advantage of the present invention is that, unlike Bank '723, there is no need to rely on costly materials and complex constructions which have high anisotropy of bending stiffness. Further, unlike Bank '723, it is not necessary to choose a high aspect ratio for the panel parameters, nor to be constrained to aligning such a narrow panel horizontally, when a wide horizontal radiation angle is required. In fact, the present invention typically has a moderate aspect ratio panel, which would be aligned with the narrower vertical dimension.

Regarding Bank '612, Fig. 1 and page 14, line 25 to page 15, line 15 describe a resonating panel having two exciters mounted to the panel. The first exciter is mounted at an optimum location as taught in WO97/09842, and the second is spaced at one-half wavelength of the coincidence frequency of waves along the horizontal axis from the first exciter. As explained on page 14, lines 3 to 5, a resonating panel may have an unwanted peak of acoustic power due to the critical or coincidence frequency. The second exciter is employed at this location so that the response associated with the coincidence frequency is smoother.[1] As explained on page 3, lines 2 to 9, the signal processing and/or filtering of the signal to the second exciter are critical.

Thus, in Bank '612 the use of the second exciter is a form of acoustic equalization directed to curing the problem of an unwanted and specific performance feature, which is localized in frequency. This performance feature is particularly a peak at coincidence and thus the speaker is designed to operate above coincidence, not below coincidence as required by the present invention. There is no teaching directed to altering the directivity or overall sound radiation pattern of the resonating panel, nor of making the directivity different in one plane relative to another. As explained on page 4, lines 3 to 16, the intention is that the normal performance is enhanced, i.e. that multiple resonant modes are more or less uniformly excited in all degrees of freedom with an essentially omni-directional radiation pattern.

As set out above, the radiation pattern produced by the present invention is the opposite of that taught in Bank '723 and is not suggested by Bank '612. Assuming, *arguendo*, that one of ordinary skill had attempted to combine the teachings of Bank '723 and Bank '612, the only logical undertaking probably would have been to try to modify the radiation of Bank '723 to cure the problem of a peak at a particular frequency, as taught by Bank '612. The radiation resulting from such a modification would still be opposite that provided by the presently claimed invention. This is especially the case for the embodiments of Bank '723 that use more than two exciters (page 4, line 28 to page 5, line 8), which are arranged in a <u>non</u>-linear pattern that would not provide the required directivity claimed by Applicant. Accordingly, Bank '612 would not have led one of ordinary skill to modify Bank '723 as alleged in the Office Action.

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[1] (As background it is noted that the coincidence frequency is the frequency at which the acoustic wave

In view of the foregoing, the Office has failed to carry its burden of making out a prima facie case of obviousness (see MPEP §§2142, 2143). Accordingly, the rejection should be withdrawn.

Conclusion

It is respectfully submitted that all of the pending claims are in condition for allowance. Prompt and favorable action is earnestly solicited.

Respectfully submitted,

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Alan I. Cantor
Reg. No. 28,163

Roylance, Abrams, Berdo & Goodman, L.L.P.
Customer Number: 01609
Telephone: (202) 659-9076
Facsimile: (202) 659-9344

speed in air matches the wave speed in the panel).